

***Dittosa*, a new genus of leucosiid
(Crustacea: Decapoda: Brachyura) from southern
Australia and New Zealand**

Cheryl G. S. Tan

Department of Zoology, National University of Singapore, Lower Kent Ridge Road,
S(0511), Republic of Singapore

Abstract.—A new genus, *Dittosa*, is established for two southern Australian species of *Philyra* Leach, 1817: *Philyra laevis* Bell, 1855, *P. murrayensis* Rathbun, 1923, and the New Zealand *Ebalia cheesmani* Filhol, 1886, on the basis of the male first and second gonopods which are of equal length, presence of two fissures on the roof of the orbit, structure of the male abdomen, form of the front and third maxilliped exopod, and appearance of the intestinal region of the carapace.

There are 41 known species in the genus *Philyra* Leach, 1817 (Bell 1855, Serène 1968, Rathbun 1924, Takeda & Nakasone 1991). These are generally characterized by their rounded carapaces, massive chelipeds, expanded exopod of third maxilliped and rather broad front which is not produced.

For the species of *Philyra* in which the male first gonopod is known, this structure is stiff and stout, and about twice to three times the length of the second gonopod (Stephensen 1946, Dai & Yang 1991). Recently, in the course of examining leucosiids in the Smithsonian Institution collection, I found that two southern Australian species, *P. laevis* Bell, 1855, and *P. murrayensis* Rathbun, 1923, and a New Zealand species, *Ebalia cheesmani* Filhol, 1886, have the male first and second gonopods of almost equal length, with the first gonopod long and sinuous, and the second gonopod elongate and slender. In addition, the number of fissures on the orbital roof, male abdominal segmentation, the form of the front, appearance of the intestinal region and, to a lesser extent, form of the third maxilliped exopod in these two species differ from those in typical *Philyra* species. In this paper, a new genus, *Dittosa*, is established for *P. laevis*, *P. murrayensis*,

and *Ebalia cheesmani* on the basis of this unique suite of characters.

For purposes of comparison, eight other species of *Philyra* were studied and these are listed in the Appendix. The following abbreviations are used in the text: G1, G2, the male first and second gonopods respectively; APE, U.S. "Albatross" Philippine Expedition and USARP, United States Antarctic Research Program. Measurements are given in the order carapace length times width in millimeters (mm), exclusive of the posterior intestinal spine and lateral tubercles. Specimens examined are deposited in the National Museum of Natural History (USNM), Smithsonian Institution, Washington D.C., U.S.A., and the Zoological Reference Collection (ZRC), Department of Zoology, National University of Singapore.

Family Leucosiidae Samouelle, 1819
Dittosa, new genus

Type species.—*Philyra laevis* Bell, 1855, by present designation.

Diagnosis.—Carapace rounded, with widely spaced tubercles or granules along the margins, surface smooth or granular, intestinal region with raised region (ridge, tu-

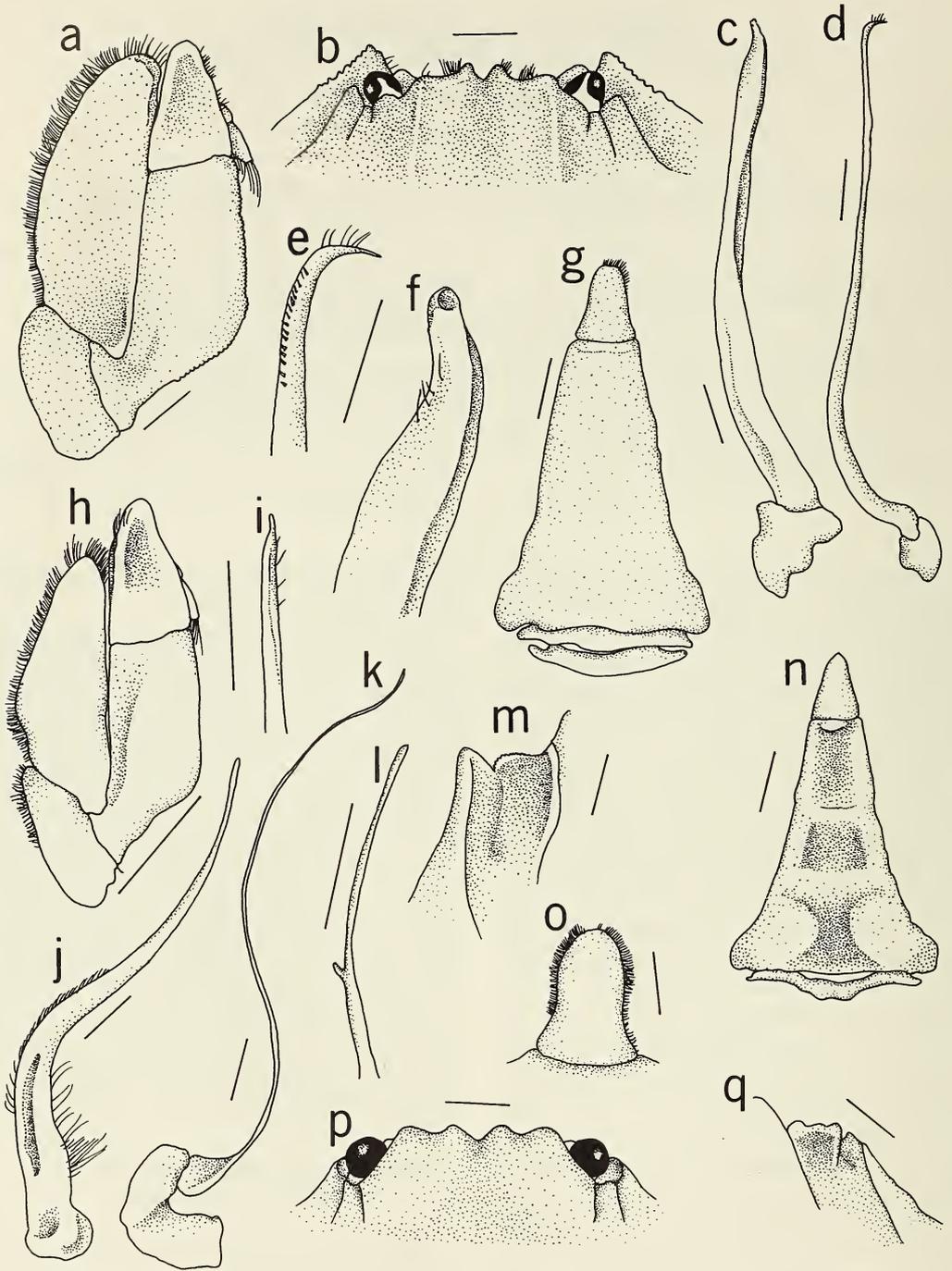


Fig. 1. *Dittosa murrayensis*, male, 18.8 × 18.4: a, right third maxilliped; b, front, dorsal view; c, right G1; d, right G2; e, right G2, apex; f, right G1, apex; g, abdomen. *Dittosa laevis*, male, 14.2 × 13.5: h, right third maxilliped; i, right G1, apex; j, right G1; k, right G2; l, right G2, apex. *Dittosa murrayensis*, male, 18.8 × 18.4: m, right pterygostomian region, ventral view, with third maxilliped removed. *Dittosa laevis*, male, 14.2 × 13.5, female, 14.0 × 13.6. n, male abdomen excluding segment 1; o, telson, female abdomen; p, front, dorsal view;

bercle or spine). Front bilobed, lobes separated by V-shaped notch, inner angle of each lobe extended and denticulate, giving front a 4-toothed appearance. Eyes medium sized, visible from dorsal view, roof of orbit with 2 sutures, floor of orbit with 1 suture. Antennules folded obliquely. Antennae occupying orbital hiatus, basal segment fixed, other segments movable. Third maxilliped with exopod not strongly dilated (sometimes dilated proximally), merus triangular, not narrowed. Chelipeds more massive than ambulatory legs, palm broad, fingers longer than palm. Male abdomen with segments 3–6 fused, suture between segments 5–6 discernible to absent, or if present, laterally interrupted. G1 elongate, usually sinuous; G2 elongate, as long as or slightly longer than G1, usually more slender.

Remarks.—In general appearance, *Dittosa* bears a close resemblance to *Philyra* sensu stricto. The massive chelipeds, form of the fingers, rounded shape of the carapace, granulation on the lateral borders of the carapace and broad front that is not produced are characters common to both genera. The most significant difference between *Dittosa* and *Philyra* is that in *Dittosa*, the G1 and G2 are almost equal in length. Such a condition is relatively rare in the Leucosiidae, being previously reported in only six other species: *Ebalia longimana* Ortman, 1892 (Stephensen 1946), *E. fasciata* Ihle, 1918, *Praebebalia longidactyla* Yokoya, 1933, *P. mosakiana* Sakai, 1965, *P. taeniata* Takeda, 1977, and *P. kumanoensis* Sakai, 1983 (Nagai 1992).

The male abdomen in *Dittosa* has the third to sixth segments fused. The suture between the fifth and sixth segments is indistinct and the sixth segment has no mobility whatsoever. In *Philyra* sensu stricto, there may be limited mobility of the sixth segment as the

suture between the fifth and sixth may reach the lateral margins of the abdomen and may be rather deep. In general, the sixth segment of the male abdomen in *Philyra* has its proximal end wider than the distal end of the fifth segment. In this way, a wide notch between the fifth and sixth segments is formed on either side of the abdomen (Fig. 3a, b) and the sixth segment may have a flattened, distal, transverse tubercle. In *P. globus* (Fabricius, 1775), the type species of *Philyra* (fide H. Milne Edwards 1837), the suture between the fifth and sixth segment is deep and the lateral notch between these segments is present on either side (Stephensen 1946:fig. 11 I). There is a median denticle on the sixth segment in this species.

The type species of *Philyra*, *Cancer globus* Fabricius, 1775, is a senior synonym of *Leucosia globulosa* Bosc, 1802. Thus, *P. globulosa* (Bosc, 1802) (sometimes wrongly attributed to H. Milne Edwards 1837) should be referred to as *P. globus* (Fabricius, 1775) (see Manning & Holthuis 1981:66).

Another useful character in *Dittosa* is that the roof of the orbit has two clear sutures corresponding to the α and β sutures described by Ihle (1918:52). In *Philyra globus* and in all other species of *Philyra* examined (see Appendix), the α suture is absent. In the case of *D. murrayensis*, the β and γ sutures are deep and open anteriorly, thus forming a prominent extra-orbital lobe (Fig. 1b).

In species of *Philyra*, the front is generally almost straight with a shallow median groove on the dorsal surface, or trilobate, with two outer lobes formed by the inner supra-orbital angle and a smaller, median triangular lobe. The former condition is true for *P. globus*. The three species of *Dittosa* have the front distinctly bilobed, each lobe being separated by a moderately deep,

←

q, left pterygostomian region, ventral view, with third maxilliped removed. Scales: e, f, i, l = 0.5 mm, others = 1 mm.

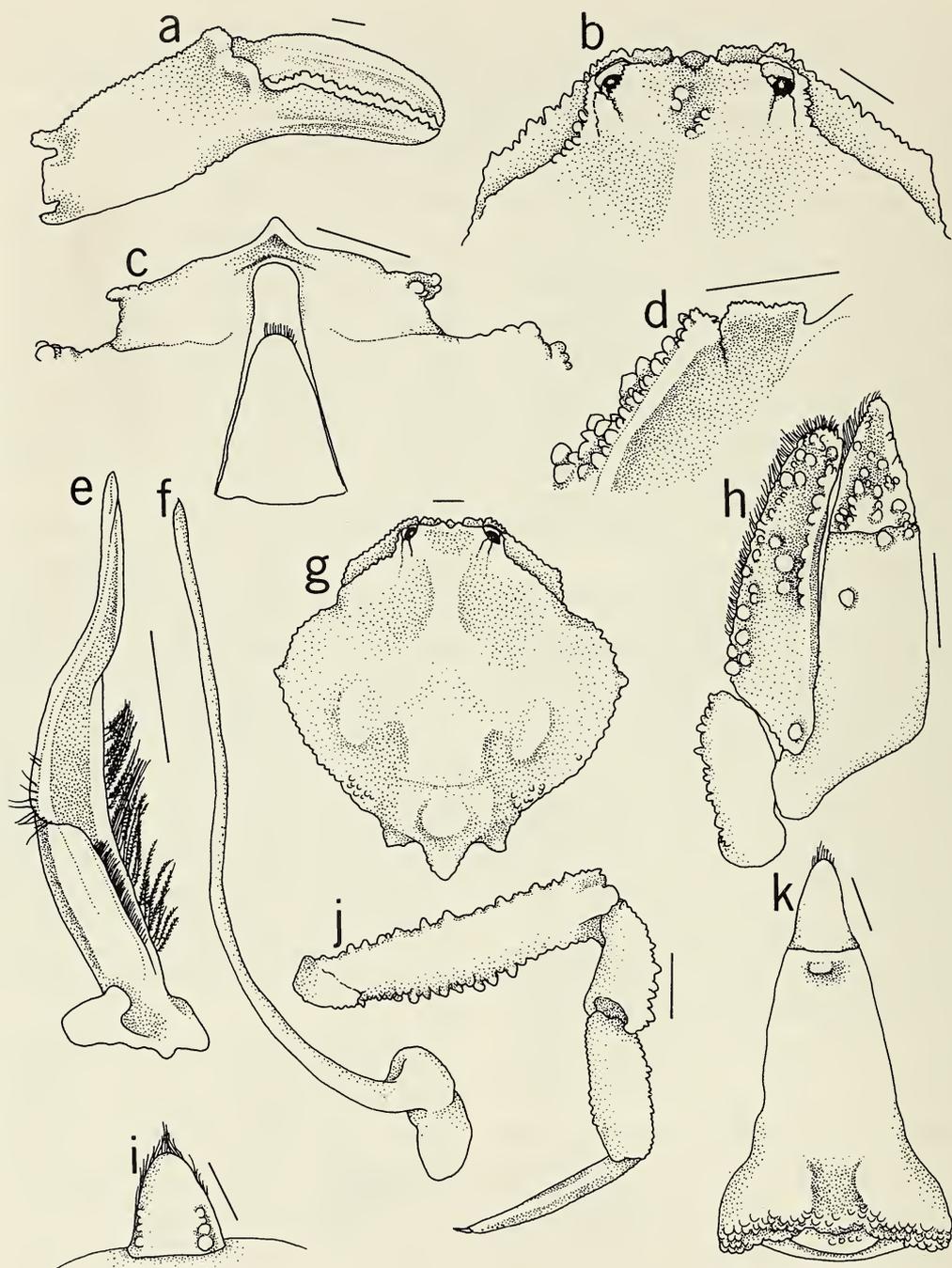


Fig. 2. *Dittosa cheesmani* (Filhol, 1886) male, 11.4 × 11.6, female: a, Male left cheliped upper surface; b, Male front, dorsal view; c, male sternum; d, male right pterygostomian region, ventral view, with third maxilliped removed; e, right G1; f, right G2; g, male carapace, dorsal view; h, male right third maxilliped; i, female abdomen, telson; j, male right last ambulatory leg; k, male abdomen. Scale = 1 mm.

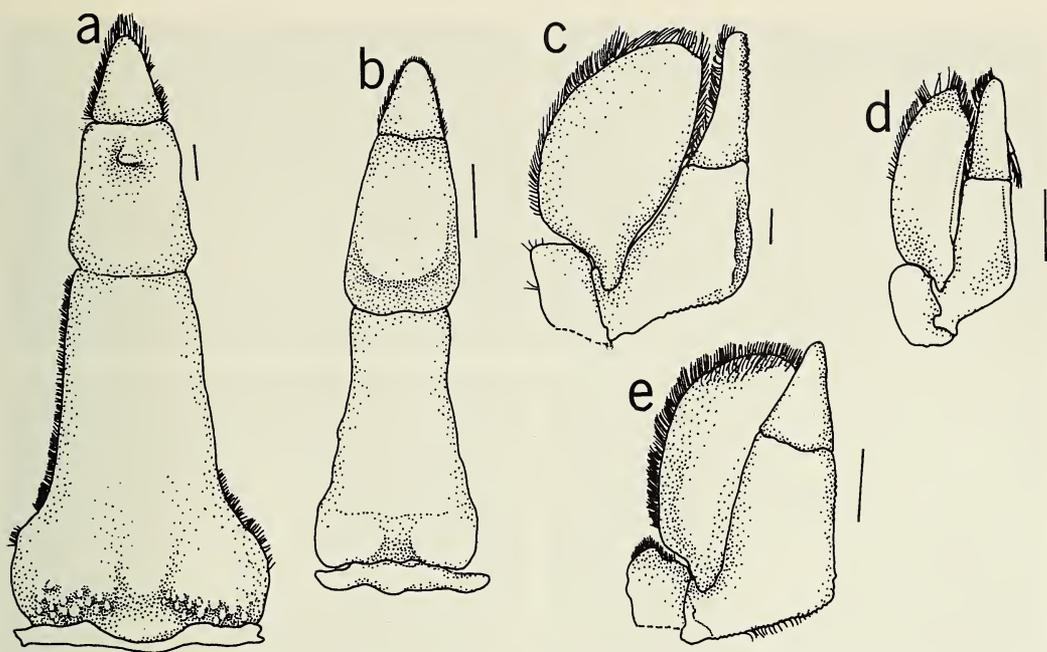


Fig. 3. Male abdomen showing notch on lateral margin between fifth and sixth segments: a, *Philyra globus*, USNM 42756, male; b, *P. olivacea*, USNM 62038, male. Right third maxillipeds: c, *P. globus*, USNM 42756, male; d, *P. olivacea*, USNM 62038, male; e, *P. syndactyla*, USNM 56781, male. Scale = 1 mm.

V-shaped median notch. The inner angles of each lobe are pointed and denticulate, conferring a "four-toothed" appearance to the front (Figs. 1b, p, 2b). The variability in this character within *Dittosa* cannot be ascertained as there are currently only three species. This character should be used in conjunction with the other characters as the front has been shown to be variable in some congeneric leucosiids. Nevertheless, generally, the "four-toothed" front is absent in *Philyra*.

In *Dittosa*, a protrusion of some sort is present on the posterior intestinal region, be it a spine or a transverse ridge (see Figs. 2g, 4A, C, E). For *Philyra*, the intestinal region, though it may be covered in granules, and swollen, does not possess spines or raised ridges. In *P. globus*, it is finely granular.

The form of the exopod of the third maxillipeds appears to gradate in *Philyra* (Fig.

3c–e). In *P. globus*, *P. globosa* (Fabricius, 1798), and *P. heterograna* Ortmann, 1892, the exopod is greatly expanded proximally, with the outer edge describing a semi-circular arc and the merus is very narrow and is shaped like a right-angled triangle (see Stephensen 1946, Fig. 11C, D). In others, e.g., *P. scabriuscula* (Fabricius, 1798), the exopod is expanded and the merus is not narrowed but rather regularly triangular. In *P. olivacea* Rathbun, 1909 (Fig. 3d), and *P. biprotubera* Dai & Guan, 1986, the exopod is less expanded but the outer edge still describes a curve and the merus is narrow. The fourth condition is shown in species such as *P. granigera* Nobili, 1906, and *P. syndactyla* Ortmann, 1892 (Fig. 3e), where the outer edge of the exopod may be straight, the distal portion only slightly dilated and the merus broad. In *Dittosa*, however, the exopod is expanded slightly proximally (Figs. 1a, h, 2h), but never as in *P. globosa*

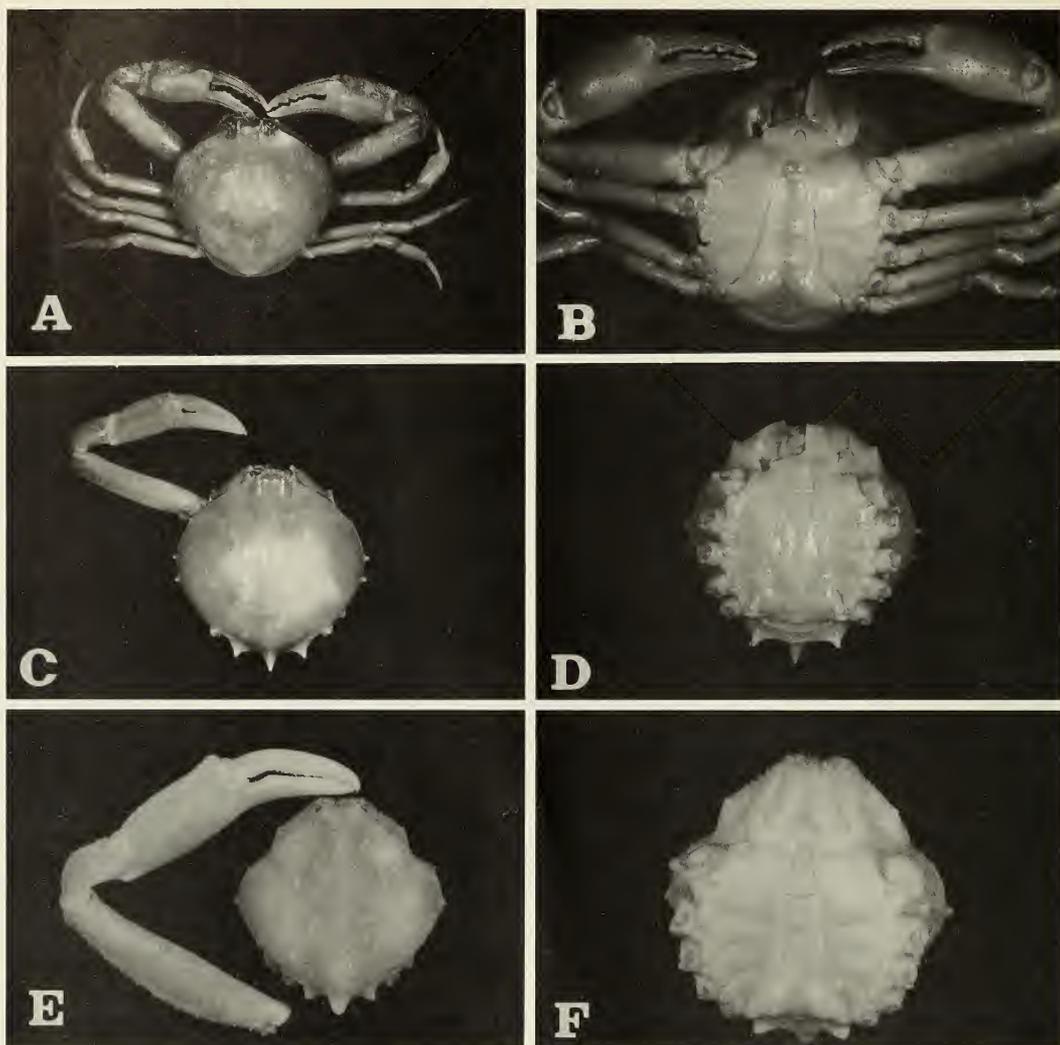


Fig. 4. *Dittosa laevis*, male, 16.6 × 15.8: A, dorsal view; B, ventral view. *Dittosa murrayensis*, male, 18.8 × 18.4: C, dorsal view; D, ventral view. *Dittosa cheesmani*, male, 11.4 × 11.6: E, dorsal view; F, ventral view.

or *P. globus*, and the merus is triangular and not narrowed. However, the third maxillipeds in *Dittosa* are rather similar to those of *P. olivacea* and *P. granigera*. Due to the variation exhibited by this character, it is advisable to use it in conjunction with other characters such as the gonopods and the number of orbital roof sutures.

The variation shown by the structure of the third maxilliped exopod and the merus in *Philyra* sensu stricto suggests the possi-

bility that the genus, as it presently stands, is heterogeneous and in need of a revision. Specimens of *Philyra* species examined here sometimes differ significantly from *P. globus* in terms of the structure of the male G1, form of the abdomen, extent to which the front edge of the buccal cavity extends beyond the front, structure and ornamentation of the sternum, form of the front and as discussed above, structure of the third maxillipeds.

Dittosa resembles also the genus *Prae-bebalia* Rathbun, 1911. The carapace in *Prae-bebalia* has lateral projections similar to that found in *Dittosa*, the chelipeds are longer than the carapace, the edge of the buccal frame projects beyond the front and there are two fissures on the upper orbital roof. Again, the chief difference between the two genera is the relative length of the G1 and G2. I have examined specimens of the type species, *Prae-bebalia extensiva* Rathbun, 1911, and have found that its G1 is much longer than the G2. Fusion of the male abdominal segments is also different, with segments 3–5 fused in *Prae-bebalia* and segments 3–6 fused in *Dittosa*. Also, in *Prae-bebalia*, the palms of the chelipeds are slender and about twice the length of the fingers. In *Dittosa*, the chelipeds are massive, the palms are broad and as long as the fingers. *Prae-bebalia* also lacks the lateral projections on either side of the intestinal projection found in *Dittosa*.

Nagai (1992) figured the G1 and G2 of *Prae-bebalia longidactyla* Yokoya, 1933, *P. mosakiana* Sakai, 1965, *P. taeniata* Takeda, 1977, and *P. kumanoensis* Sakai, 1983. These differ from *Prae-bebalia extensiva* in that they have G2 as long as or slightly longer than G1 (Nagai 1992, Fig. 2) and the abdominal segments 3–6 are fused. Their relatively smaller size (4.3–6.5 mm length, 4.3–6.5 mm width) also separates them from *P. extensiva* (12.7 × 13.0). This suggests that a group distinct from *Prae-bebalia* sensu stricto should perhaps be recognized and that a review of the genus is necessary. From Nagai's (1992) figures, the form of the front (broadly bilobed), absence of lateral projections on the carapace, slender chelipeds, and absence of posterior projections of the four *Prae-bebalia* species are characters that serve to distinguish them from *Dittosa*.

Etymology.—The name is arbitrarily derived from the Greek "dittos" (dissos; dixos) which means "two-fold, double", alluding to the equal length of the male first and second gonopods. The gender is feminine.

Dittosa laevis (Bell, 1855)

Figs. 1h–l, n–q, 4A, B

Philyra laevis Bell, 1855:300, pl. 32, fig. 7 (type locality: Port Adelaide, South Australia).—Hale, 1927:194, fig. 192, 195.

Material examined.—USNM, 1 male, 14.3 × 13.6, 1 female, 14.1 × 13.6, South Australia, Kangaroo Island, coll. C. M. Hoy, 10 Jan 1920.—USNM, 2 males, 16.4 × 16.0, 16.6 × 15.8, 2 females 17.7 × 17.4, 18.1 × 17.4, South Australia, Victoria, Swan Bay, Queenscliffe, 100 yards north of railway station, *Zostera* flats. coll. C. F. E. Roper & B. Burn, 7 Feb 1976.—USNM 64650, 1 male, 1 female, Ralph's Bay, Tasmania, dredge, 1.8–5.5 m, oyster fishermen coll., Aug 1926.—USNM 64723, 7 males, 1 female, near entrance to Port Phillip, Victoria, Australia, sandy bottom, don. Australian Museum, Jan 1926.

Description of male.—Carapace slightly longer than broad, surface rather smooth, with minute punctae, regions not well-demarcated, hepatic and subhepatic margins raised to form facet, anterolateral margin with short oblique fissure immediately after margin of hepatic region, followed by obtuse triangular angle, junction of antero- and posterolateral margins with rounded tubercle, margin between tubercle and obtuse triangular angle on anterolateral margin straight, posterior margin with smoothly curving ridge, subhepatic region with large, obtuse triangular angle, posterior intestinal region with flat, rounded transverse ridge.

Front bilobed; edge of buccal cavern, particularly outer angle, slightly visible beyond front, extending beyond orbital margin. Outer surface of third maxillipeds smooth, margins setose, exopod slightly dilated at base, tapering to rounded point distally, merus triangular, with shallow longitudinal depression on distal half.

Chelipeds minutely punctate as on carapace, fingers longer than palm, inner and outer surfaces of fingers each with 2 distinct rows of large punctae, cutting edges with

rounded blade-like teeth; anterior edge of propodus of ambulatory legs carinate, dactylus flattened, both edges carinate.

Outer surface of male abdomen minutely punctate, distal end of segment 6 with median, transverse, low, rounded tubercle, short median, transverse groove present at base of segment 6, telson triangular, apex pointed. G1 long, sinuous, proximal half setose, stout, gradually tapering to slender, pointed apex, apex simple, sparsely covered with short setae; G2 very thin, slightly longer than G1, slender throughout, tip bifid with one branch reduced to pointed lobe, other branch long.

Female: Telson elongate, bell-shaped. Non-sexually dimorphic characters similar to male.

Remarks.—The ridge on the posterior intestinal region of the carapace varies in form in individual specimens. It may be nearly indistinct, particularly in larger specimens. Hale (1927:195) remarks: "The ridge of the intestinal region may be obsolete in old examples, but in juveniles it is often prominent and produced upwards in the form of a subtriangular tooth; the carapace of the young sometimes bears large scattered granules". Hale (1927:195) also gives an interesting account of their behavior, noting that the crabs probably remain buried in the mud at high water and during rough weather, only commencing their activities at low-tide. During mating, the male performs a kind of courtship dance during which the female becomes quiescent. The male then grasps the female and moves off, presumably to a burrow. The specimens I examined are from South Australia (type locality of *D. laevis*) and match Bell's (1855) description and figures well.

Dittosa murrayensis (Rathbun, 1923)

Figs. 1a–g, m, 4 C, D

Philyra murrayensis Rathbun, 1923:136, pl.

34 [type locality: Off Murray river mouth,

South Australia].—Hale, 1927:195, Fig. 196.

Material examined.—USNM, 1 male, 18.8 × 18.4, South Australia, Victoria, Port Phillip Bay, 3 miles west of Brighton Pier, Stn. 5 and 6, 11 m, very shelly bottom, colls. C. F. E. Roper, S. Stevenson & R. Plant, 10 Feb 1972.

Description.—Carapace slightly broader than long, surface with minute punctae and granules, regions not well-demarcated, shallow, oblique groove present immediately behind margin of hepatic region, intestinal region defined by groove anteriorly and laterally; hepatic and subhepatic margins raised to form facet, anterolateral margin with small denticle immediately after hepatic margin, junction of antero- and posterolateral margin with 2 denticles, posterolateral margin with denticle close to posterior margin, posterior margin with flattened, upward pointing spine on either side of median line, posterior intestinal region with large backward and upward pointing spine on higher level than posterior marginal spines; subhepatic region with median denticle.

Front bilobed; extraorbital lobe rather pronounced. Edge of buccal cavern slightly visible beyond front, outer angle projecting beyond orbital margin. Surface of third maxilliped ischium smooth, inner margin finely granular, setose along margins, exopod slightly dilated proximally, tapering gradually distally. Chelipeds very long, stout, surface finely granular, fingers longer than palm, flattened, cutting edges finely denticulate; anterior edge of propodus of ambulatory legs carinate, dactylus flattened, both edges carinate.

Outer surface of male abdomen smooth, telson triangular, distal end rounded, edges setose. G1 stouter and slightly shorter than G2, long, rather straight, tapering to narrow tip distally; G2 slender, elongate; with curved tip, tip sparsely setose.

Remarks.—The presence of spines on the intestinal region and posterior margin of the

carapace, the structure of the G1 and G2, the absence of a tubercle on the penultimate segment of the male abdomen, the long chelipeds of the male, the prominent outer angle of the buccal frame and the relative size of this species distinguishes it from *D. laevis*. Hale (1927:196) remarks that "the small tubercles of the carapace are much more distinct in some specimens than in others, and the obsolete median carina may bear scattered tubercles." This is the only specimen of *D. murrayensis* found in USNM and it matches Rathbun's (1923) description and plate well. Moreover, it was collected from Port Philip Bay, South Australia, close to the mouth of the River Murray, which is the type locality of the species.

Dittosa cheesmani (Filhol, 1886)

Fig. 2, 4 E, F

Ebalia laevis McLay, 1988:94, fig. 18a-c (see McLay, 1988 for complete synonymy).

Material examined.—USNM 270105, male, 11.4 × 11.6; "Eltanin," Cruise 23, Stn. 1709, 43°31'S–43°30'S, 176°10'W–176°08'W, 143–183 m, Blake Trawl, 24 May 1966, coll. USARP; USNM 270106, 15 males, 14 females; ZRC, 1 male, 1 female.

Description of male.—Carapace slightly broader than long, surface covered with granules, those at the edges mushroom shaped, intestinal and cardiac regions demarcated by shallow grooves, hepatic and subhepatic margins raised to form facet, anterolateral margin with shallow notch immediately after hepatic margin, junction of antero- and posterolateral margins with pointed tubercle, posterior margin with flattened, triangular projection on either side of median line, subhepatic region with obtuse triangular projection, mid-intestinal region with rounded tubercle, posterior intestinal region with rounded spine.

Front bilobed, lobes separated by u-shaped notch; edge of buccal cavern visible beyond front, extending beyond orbital margin. Outer surface of third maxillipeds

with large, round granules, outer margins setose, exopod slightly narrower than ischium, anterior surface of merus with shallow depression, without elevated granules.

Outer edge of chelipeds with pointed granules of varying sizes, surface with flat pavement of granules, palm broader than merus, outer edge carinate, distal edge with ridge just at base of movable finger, fingers slightly shorter than palm, immovable finger cutting edge with large, triangular tooth close to proximal end, movable finger with corresponding notch, cutting edges denticulate; anterior edge of first to third pairs of ambulatory legs with acuminate granules, last pair of legs with acuminate granules lining both anterior and posterior edges, dactylus flattened, carinate and setose on both edges.

Proximal end of abdomen with raised granules, distal end of penultimate segment with transverse tubercle, telson triangular, with rounded apex. Proximal end of G1 rather stout, gradually tapering to simple point, proximal half with long setae, G2 slender, elongate, slightly longer than G1.

Paratype females: Telson triangular, with rounded tip. Projections on posterior margin less pointed than that in males. Other non-sexually dimorphic characters similar to males.

Remarks.—There has been some confusion concerning the identities of *Ebalia laevis* Bell, 1855 (formerly *Phlyxia laevis*) and *Ebalia cheesmani* Filhol, 1886. Bennett (1964) synonymised both species, noting that in specimens of *E. laevis* which he examined, the degree of variability was high, particularly with respect to ". . . the postero-dorsal projections, the anterolateral outline and the granulation . . ." (Bennett, 1964:21), making it difficult to distinguish it from *E. cheesmani*.

Additional confusion has been created due to the fact that Bell's (1855) *Phlyxia laevis* (now *Ebalia laevis*), differs considerably from what other authors have called *Phlyxia* (or *Ebalia*) *laevis* or *E. cheesmani* (for com-

plete listing of authors, see McLay, 1988). From Bell's (1855) figures, it can be seen that the front is narrow and projected forwards, and the anterior margin of segment six of the abdomen is shown to have a median forward pointing denticle, followed by a flat tubercle. This is not mentioned by Bennett (1964) in his reasons for synonymising *E. cheesmani* with *E. laevis*. Although it is known that characters such as granulation, structure of the carapace anterolateral margins and posterior projections are highly variable within leucosiid species, characters such as elongation of the front and particularly, the presence of a median, anteriorly-directed denticle on the anterior margin of the male sixth abdominal segment, seem to be constant and reliable. The latter character has been used in defining other leucosiid taxa such as *Drachiella* Guinot, 1976. Thus, *E. laevis* sensu stricto, may be a true *Phlyxia* or even a *Praebebalia*, but this can only be determined after the type specimens are examined. It is unlikely to be a species of *Dittosa*, due to the reasons mentioned above. It is certainly very unlikely to be a synonym of *P. cheesmani*.

Therefore, it is best to refer the present specimens to *E. cheesmani*, as they agree, in general, with what has been described.

Bennett's (1964) remarks concerning the large degree of variation found in specimens of *E. laevis* may perhaps suggest the presence of more than one species. In the specimens I observed, the variation in characters is not as substantial.

Acknowledgments

This study was carried out as part of the author's Graduate Student Fellowship at the Department of Invertebrate Zoology, Division of Crustacea, National Museum of Natural History, Smithsonian Institution. The author acknowledges funding from the Smithsonian Institution, R. B. Manning for his supervision, R. Lemaitre for his en-

couragement and advice, A. Rajaguru, K. Reed, P. Rothman, L. Ong (Museum Support Center), J. Maret and C. Walter for their help and support, W. Moser for his expert advice on photography, and the other staff at the Department of Invertebrate Zoology for their kind assistance. The author thanks P. Davie, Queensland Museum, for reviewing the manuscript, and P. K. L. Ng, Department of Zoology, National University of Singapore, for his advice and comments.

Literature Cited

- Bell, Th. 1855. A Monograph of the Leucosiidae, with observations on the relations, structure, habits and distribution of the family: a revision of the generic characters and descriptions of new genera and species, Hora Carcinologicae, or Notices of Crustacea, I.—Transactions of the Linnaean Society of London 21:277–314, pls. 30–34.
- Bennett, E. W. 1964. The marine fauna of New Zealand: Crustacea Brachyura.—New Zealand Department of Scientific and Industrial Research Bulletin 153:1–120.
- Bosc, L. A. G. 1802. Histoire naturelle des Crustacés, contenant leur description et leurs moeurs, avec figures dessinées d'après nature, 1:1–258, pls. 1–8; 2:1–296, pls. 9–18. Paris.
- Dai, A., & S. Guan. 1986. One new species of *Philyra* from Guangdong Province.—Acta Zootaxonomica Sinica 11(2):148–150.
- , & S. Yang. 1991. Crabs of the China Seas, China Ocean Press, Beijing, China, 608 pp, 74 pls.
- Fabricius, J. C. 1775. Systema entomologiae, sistens insectorum classes, ordines, genera, speceis, adiectis synonymis, locis, descriptionibus, observationibus:1–832.
- . 1798. Supplementum entomologiae systematicae, Hafniae, 572 pp. de Haan, W., 1833–50. Crustacea. In P. F. von Siebold, Fauna Japonica sive Descriptio Animalium, quae in Itinere per Japoniam, Jussu et Auspiciis Superiorum, qui Summum in India Batava Imperium Tenet, Suscepto, Annis 1823–1830 Collegit, Notis, Observationibus et Adrumbrationibus Illustravit, i–xvii, i–xxxii, ix–xvi, 1–243, pls. A–j, L–Q, 1–55, circ. tab. 2. Lugdunin-Batavorum [Leiden].
- Filhol, H. 1886. Catalogue des Crustacés de la Nouvelle-Zélande, des Îles Auckland et Campbell.

- In* Mission de l'Île Campbell 3(2):349–510; 3(4) Atlas, pls. 38–55, Paris.
- Hale, H. M. 1927. The crustaceans of South Australia. Part I. Adelaide, Australia, 201 pp.
- Herbst, J. F. W. 1782–1804. Versuch einer Naturgeschichte der Krabben und Krebse, nebst einer systematischen Beschreibung ihrer verschiedenen Arten. Vols. 1–3, Berlin and Stralsund, 515 pp., 62 pls.
- Ihle, J. E. W. 1918. Die Decapoda Brachyura der Siboga-Expedition, 3. Oxystomata: Calappidae, Leucosiidae, Raninidae.—Siboga Expeditie 39b(2):159–322.
- Leach, W. E. 1817. The zoological miscellany, being descriptions of new or interesting animals, vol. 3, London, vi + 151 pp., pls. 121–149.
- Manning, R. B., & L. B. Holthuis. 1981. West African Brachyuran Crabs (Crustacea: Decapoda).—Smithsonian Contributions to Zoology 306:1–379.
- McLay, C. L. 1988. Crabs of New Zealand.—Leigh Laboratory Bulletin 22:1–463.
- Milne Edwards, H. 1837. Histoire naturelle des Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux, vol. 2, Paris, 532 pp.
- Nagai, S. 1992. Study on Japanese *Praebebalia* (Leucosiidae, Brachyura).—The Nanki Biological Society 34(1):28–32.
- Nobili, G. 1906. Crustacés décapodes et stomatopodes (Mission J. Bonnier et. Ch. Pérez) (Golfe Persique 1901).—Bulletin Scientifique de la France et Belgique 40:13–159.
- Ortmann, A. 1892. Die Abtheilungen Hippidea, Dromiidea und Oxystomata: Die Decapoden-Krebse des Strassburger Museums, mit besonderer Berücksichtigung der von Herrn Dr. Döderlein bei Japan und bei den Liu-Kiu-Inseln. gessammelten und z. Z. im Strassburger Museum aufbewahrten Formen. V. Theil.—Zoologische Jahrbücher, Abtheilung für Systematik, Geographie und Biologie der Thiere 6:532–588, pl. 26.
- Rathbun, M. J. 1909. New crabs from the Gulf of Siam.—Proceedings of the Biological Society of Washington 22:107–114.
- . 1911. Brachyura of the Percy Sladen Trust Expedition to the Indian Ocean in 1905.—Transactions of the Linnean Society of London 14(2):191–261, pls. 15–20.
- . 1923. Report on the crabs obtained by the F. I. S. "Endeavour" on the coasts of Queensland, New South Wales, Victoria, South Australia and Tasmania.—Biological results of the fishing experiments carried out by the F. I. S. "Endeavour" 1909–1914 5(3):95–156, pls. 1–42.
- . 1924. Results of Dr. E. Mjöberg's Swedish scientific expedition to Australia 1910–1913, Brachyura, Albuncidae and Porcellanidae.—Arkiv för Zoologi, 16(23):1–33, 1 pl.
- Samouelle, G. 1819. The entomologist's useful compendium, or an introduction to the knowledge of British insects, London, 469 pp.
- Sakai, T. 1965. The crabs of Sagami Bay, collected by His Majesty the Emperor of Japan, edited by Biological Laboratory, Imperial Household, Tokyo, 206 pp., pls. 1–100.
- . 1983. Description of new genera and species of Japanese crabs, together with systematically and biogeographically interesting species (I).—Researches on Crustacea 12:1–44, pl. I–VIII.
- Serène, R. 1968. The Brachyura of the Indo-West Pacific region. Prodrômus for a checklist of the non-planktonic marine fauna of Southeast Asia.—Singapore National Academy of Science special publication 1:33–112.
- Stephensen, K. 1946. The Brachyura of the Iranian Gulf.—Danish Scientific Investigations in Iran 4:57–237.
- Stimpson, W. 1858. Prodrômus descriptionis animalium vertebratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem a Republica Federata Missa.—Proceedings of the Academy of Natural Sciences of Philadelphia 10(4): 31–163.
- Takeda, M. 1977. Crabs of the Ogasawara Islands, V. A Collection made by dredging.—Memoirs of the National Science Museum 10:113–140, pls. 12–17.
- , & Y. Nakasone 1991. Three leucosiid crabs of the genus *Philyra* from Okinawa, the Ryukyu Islands, with description of a new species.—Bulletin of the National Science Museum Series A (Zoology) 17(1):19–24.
- Yokoya, Y. 1933. On the distribution of Decapod crustaceans inhabiting the Continental shelf around Japan, chiefly based upon the materials collected by S. S. "Sôyô-maru," during the year 1923–1930.—Journal of the College of Agriculture, Tokyo Imperial University 12(1), 226 pp.

Appendix

List of *Philyra* species examined*Philyra anatum* (Herbst, 1782)

USNM 39653, 1 male, East of Koh Chang, Thailand, 11m, seine, 25.i.1900; USNM 39654, 1 juvenile, Sound at Koh Chang, Thailand, 5.5-9 m, soft clay bottom, coll. 1900.

Philyra globus (Fabricius, 1775)

USNM 42756, 3 males, 2 females, Ganges Delta, India; 2 females, Stn. GVF 53, channel between Songkhla and Goh Gnu Island, 3 Nov 1957.

Philyra olivacea Rathbun, 1909

USNM 62038, 1 male, tideflats, Tsimei, China, don. S. F. Light (University of China), Jun 1923; USNM 57505, 1 young female, San Mun Bay, East Coast of China, coll. M. Maki, 11 Jun 1922; 1 female, of Tachalom, Gulf of Thailand, 28 Jul 1923.

Philyra pisum de Haan, 1841

USNM 55381, 2 males, 2 females, Kagi, Taiwan, Taihoku Normal School coll., Aug 1918; USNM 54522, 4 males, Chiba Prefecture, coll. M. Sasaki; 1 male, no data; USNM 45859, 1 male, Japan, exchange, no other data; USNM 18865, 1 male, Atami Province, Japan, "Mr. Sakamoto," no other data; 2 males, 2 females, Chemulpo, Korea, coll. P. L. Jony.

Philyra platychira de Haan, 1841

USNM 73207, 1 male, 1 female, Iloilo, Panay Island, Philippines, Ilo Ilo 'Eclipse' Expedition, coll. H. C. Kellers, April 1929; USNM 65350, 1 female, Lubig Bay, Port Binanga, Philippines, coll. APE, 8 Jan 1908; 1 female, near Mariveles, Luzon, Philippines, coll. A. M. Reese, 8 Jan 1908.

Philyra punctata Bell, 1855

USNM 252713, 1 male, 1 female, between Mossel Bay and Algoa Bay, South Africa, 32 m, coll. R/V 'Thomas B. Davie,' 15 Feb 1980; USNM 221770, 1 male, 1 female, between Port Elizabeth and Mossel Bay, South Africa, R/V 'Thomas B. Davie,' 15 Feb 1980.

Philyra syndactyla Ortmann, 1892

USNM 56781, 12 males, 1 female, mouth of Jeddo Bay, Yenosima, Japan, coll. E. L. Morse; USNM 45863, 20 males, 2 females, Yenosima, Japan.

Philyra tuberculosa Stimpson, 1858

USNM 57768, 1 male, Tsimei, China, coll. S. F. Light (University of China), Jun 1923.

Praebehalia extensiva Rathbun, 1911

USNM 041064, Holotype male, Seychelles Provi-
dence, West Indian Ocean, Stn. D8, 229 m, coll. R/V
Sealark, 4 Oct 1905.